CLAIMS

1. A method for controlling transmit diversity in a first communication device operating in a system including the first communication device and a second communication device, the first and second communication devices both having stored a pre-determined basis set $\{\mathbf{w}_i\}$, the method comprising the steps of:

(a) transmitting a packet from the first communication device to the second communication device by a transmit Diversity (TD) scheme using a first basis from $\{\mathbf{w}_i\}$;

(b) using the same basis as in step (a) for the next packet to be transmitted by the first communication device if the second communication device sends an acknowledgment (ACK) to the first communication device; and

(c) using a different basis from $\{\mathbf{w}_i\}$ by both the first and second communication devices if the second communication device sends an negative-acknowledgment (NACK) to the first communication device in response to step (a).

2. A method as defined in claim 1, wherein the first communication device includes a plurality of antennas (M) and in step (c) using a different basis by the first communication device causes the first communication device to select a different permutation of the plurality of antennas than the one used in step (a).

3. A method as defined in claim 1, wherein the first communication device uses different basis for further retransmissions if further retransmissions are required.

4. A method as defined in claim 1, wherein the second communication device uses different basis for receiving further retransmissions if further retransmissions are required.

5. A method as defined in claim 1, wherein the first and second communication devices adaptively changes the basis using a pre-determined order or using a selection algorithm known to both devices for each retransmission of a packet.

6. A method as defined in claim 1, wherein the first communication device includes M transmit antennas and the basis is selected from a set of M x M permutation matrices derived from an identity matrix.

7. A method as defined in claim 1, wherein in step (c) where the index of the new basis to be used in the first and second communication devices are derived using a frame counter or index known to both the first and second communication devices.

8. A method as defined in claim6, wherein the order for which basis to select from a set of M X M matrices in step (c) is known by both the first and second communication devices.

9. A method as defined in claim 1, wherein the first communication device includes M transmit antennas and the basis is selected by both the first and the second devices from a set of M x M rotation matrices.

10. A method as defined in claim 9, wherein the first communication device includes 4 antennas (M=4) and the matrix is defined as

$$\mathbf{W}_i = \begin{bmatrix} \cos\phi_t & 0 & -\sin\phi_t & 0 \\ 0 & \cos\phi_t & 0 & -\sin\phi_t \\ \sin\phi_t & 0 & \cos\phi_t & 0 \\ 0 & \sin\phi_t & 0 & \cos\phi_t \end{bmatrix},$$

where ϕ is chosen from $\{0, \pi/8, \pi/4, 3\pi/8\}$.

11. A communication device for communicating with a second communication device, the communication device comprising:

a receiver for receiving an ARQ signal from the second communication device, and

a transmit diversity controller having a transmit diversity configuration and in response to the ARQ signal determines if the transmit diversity configuration used to communicate with the second communication device needs to be adjusted.

12. A communication device as defined in claim 11, wherein the communication device has stored in the transmit diversity controller a pre-determined basis set $\{w_i\}$, that is also found in the second communication device.

13. A communication device as defined in claim 12, wherein the communication device transmits a packet to the second communication device using a TD scheme with a first basis from $\{w_i\}$, and in response to receiving a negative-acknowledgment (NACK) signal from the second communication device the transmit diversity controller selects a different basis from $\{w_i\}$ for the next transmission.

14. A communication device as defined in claim 13, wherein the transmit diversity controller selects a different basis by taking a different permutation of an identity matrix stored within the communication device.